

Lava Tubes as Targets for Astrobiological Exploration

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Lava tubes are conduits that transport basaltic magma from their eruptive site or a breakout point to the advancing flow front and margin. Upon cessation of the eruption, liquid lava commonly drains from the tube, leaving a hollow space, or cave, behind. In some cases, parts of the lava tube roof sag to the floor or collapse; in other cases, roofs or parts of roofs remain intact for geological periods. On Earth, large un-collapsed lava tubes exceed 10 m in diameter and systems of lava tubes can be traced for more than 32 km. Cooled lava tubes often serve as conduits for water and, because of the insulating properties of basalts, the temperature within lava tubes is more constant than on the surface. Given these conditions, terrestrial lava tubes are common habitats for biota, some of which are distinctive. Partly collapsed lava tubes have been identified on the Moon and Mars, and are likely to be found in basaltic lava flows on other planetary bodies. For example, the flanks of the shield volcano *Olympus Mons* and other volcanoes on Mars show hundreds of flows that were emplaced through lava tubes. Given evidence from *Mars Express* and *Mars Odyssey* for recent water in some of these areas, uncollapsed parts of the lava tubes could represent protected habitats important for astrobiological exploration.